

MONTANA TEEN DRIVER EDUCATION AND TRAINING

Module 5.1 – Adverse Conditions

Lesson Plan & Teacher Commentary

Long-term Learning Goals:

The student understands the legal and risk prevention procedures leading to good habits for adverse driving conditions such as glare, low-light conditions, darkness, fog, dust, precipitation, winter weather, and smoke and can evaluate risk prevention procedures. The student uses vision control, motion control, and steering control to increase visibility and reduce and manage risk.

The student describes extreme weather conditions, such as flooding, heat, cold, storms, blizzards, or strong winds, and evaluates alternative routes and vehicle and driver limitations to apply time and space management strategies for reduced risk vision control, motion control, and steering control.

Students' Learning Targets:

The student is expected to:

- describe sources for glare and procedures to protect from glare;
- describe and demonstrate driving strategies during low-light or darkness conditions;
- describe and apply laws regarding headlight use;
- analyze headlight projection and efficient and proper use of vehicle illumination;
- describe fog-related reduced visibility conditions and procedures to reduce risk;
- describe winter driving conditions that reduce visibility and procedures to reduce risk;
- describe limited visibility conditions caused by smoke and dust and procedures to reduce risk;
- describe rain-related reduced visibility driving conditions and procedures to reduce risk.
- describe extreme weather driving conditions such as flooding, heat, cold, storms, blizzards, and strong wind;
- describe risks associated with driving during extreme weather driving conditions;
- explain reduced risk strategies to compensate for extreme weather driving conditions.

Materials Needed:

1. Module 5.1 PowerPoint Presentation
2. Module 5.1 Fact Sheets (printed for each student)
3. Module 5.1 Teacher Commentary (printed out)
4. Paper

TEACHER COMMENTARY

The following teacher commentary includes questions you can ask during the presentation to engage students and have them develop key concepts related to adverse conditions.

Thumbnails of the module slides are provided to help you to connect the materials, data, and questions with the presentation.

Slides 2-3: Adverse Conditions Objectives

These slides provide a summary of the Essential Knowledge and Skills topics for this module.

Slide 4 – What are adverse conditions?

What causes adverse driving conditions?
Basically any driving situation where the road and driving environment is something other than dry, with good visibility, good traction, good lighting, and sunny weather with the sun directly overhead.

Adverse conditions are most often associated with weather events. While that is mostly true, fires cause a lot of smoke and hazard for driving because of the reduced visibility and risk of being caught in a fire.

Driving on dusty roads can also be an adverse condition. There are many gravel roads in Montana and driving behind someone on a gravel road in the middle of summer creates not only reduced visibility, but increased wear and tear on your car's engine.

There are many examples of adverse conditions and you will see them throughout this presentation. Your job is to identify the adverse condition, decide the actions you need to take to manage it, and then develop the skill and good judgment to drive accordingly.

Adverse driving conditions are unfavorable, so the risks are higher. It takes more vigilance on your part to make sure you do not fall victim to the dangers associated with adverse driving conditions.



Slide 4 – Zone Control for Adverse Conditions

The best solution for adverse conditions is to stay in place--stay at home or at a friend's--until the adverse condition subsides. If that is not possible, then being prepared to drive in those conditions will help ensure your safety.

It all starts with Zone Control: finding the adverse condition. If you can detect the adverse condition early then you will know what to do to manage your risk. Early detection of changes in traction and visibility will help you make informed and safe decisions. It also gives you more time to *respond* to a situation rather than *reacting* to a situation. Responding involves small adjustments in speed and lane position and reacting involves large adjustments in speed and lane position.

Good vision control is the key to see what you are about to encounter. You can also detect adverse conditions by detecting a change in the sound of the car and roadway and by the feel of the wheel and tires. It takes our senses to give us the advantage in early detection.

Finding the adverse condition is just the first step. When we have found the adverse condition, we then need to solve a zone change. There are many different things we can do and those will be discussed later in this presentation.

Controlling the situation requires that you have time to make final adjustments to your solution if problems arise or your solution wasn't the best. Give yourself time, space and the opportunity to make changes as needed.

Zone Control for Adverse Conditions

- Find—Identify the adverse condition as a closed zone.
- Solve—Check related zones, adjust speed and lane position for conditions.
- Control—Make sure your solution works and make adjustments as needed.

Slides 5-6 – Weather and Atmospheric Conditions

Adverse conditions happen in many different ways. Forest fires and smoky highways, heavy rains and flooding to dusty, dry gravel roads create challenges to the driver. Faced with adverse conditions, how will they safely reach their destination?

Questions to ask as you review the images on the slide:

1. How could each of these adverse conditions impact where you can go and how you should drive here?
2. Describe what you should do to be safe and manage the risks associated with these adverse conditions.
3. What should you do if caught in one of these situations?



Slide 7 – Good Solution?

This video shows a person trying to drive their car through water that is too deep. Eventually the car floats and loses contact with the roadway. It starts to turn in the current.

1. The driver obviously saw the adverse condition and decided that her solution was to drive through the deep water. Was this a good solution?
2. What could she have done differently?
3. Why do people choose to drive through situations like these?
4. Could more information have helped the driver make a better decision?



Slide 8 – Glare, Fog and other Adversities

We gather 90% of our information about driving through our eyes and ability to see. If that is encumbered in any way we significantly reduce our ability to know the conditions of our zones ahead. Here are some strategies for driving with limited visibility.

Describe the situation and how it limits your visibility and then describe how the solution would help you manage the risk of reduced visibility.



1. Clean your windows.
2. Use your headlights high beams effectively.
3. Use low beams at night in fog and snow.
4. Install new wiper blades and use them at the correct speeds to remove rain and snow from windshield.
5. Sunglasses.
6. Visor.
7. Listen for traffic noise and increase your vigilance for effective scanning in situations where your visibility is limited.
8. Slow down.
9. Check temperatures to avoid being surprised by icy conditions.
10. In foggy conditions remember that people tend to drive faster than they can see. Be sure to slow down, use your headlights on low beam, and increase your following distance being ready to stop quickly when situations develop.

Slide 9 – Snow

Adverse conditions don't always occur in isolation. Often times when we have snow we also have fog or blowing snow which affects our traction and visibility.

Here is a list of strategies to manage combined adverse conditions. Have the students describe what they would do if presented with these situations. Use the list below to augment the discussion with students.



1. In low-light situations make sure to use your headlights effectively and intensify your scanning.
2. To protect from bright headlights, look to the right and use the painted "fog line" or edge of the road as a reference.
3. Keep an eye on the approaching vehicle out of the left corner of the field of vision.
4. Develop the habit of easily changing the mirror to the "night" setting by flipping the small lever at the bottom of the mirror.
5. Keep the headlights windows clean.
6. Increase following distance from 4 seconds to 6 seconds.

Slide 10 – Low light and rain - Video

There are many factors that make this driving scenario an adverse condition.

Watch the video and have the students describe the adverse conditions created by the rain, by the oncoming headlights, and by the multiple trucks being passed on this grade.



Questions you can ask:

1. What can the driver do to reduce the risks in this situation?
2. What zones should she check as she sees her front zone closed?
3. What lane position should she be in?
4. How can she deal with the oncoming glare of the headlights?

Slide 11 – Managing Adverse Conditions Video

Identify the problems portrayed by the video and develop a solution for the closed zone. Describe them in terms of speed, lane position, and communication options to effectively solve the problem you see.



Slide 12 – How to use your vehicle lights

Headlights on a $\frac{1}{2}$ hour after sunset is the law, but best practice is headlights on all the time for every drive.

Consider this. The law says that your lights must illuminate people or other vehicles at 350 with your high beams. The highway speed in Montana is 65-70 miles per hour for most highways. At that speed you are traveling at 104 feet per second. With good reflexes it still takes you about $\frac{3}{4}$ of a second to see and react to something. That means you will travel about 75 feet before you start braking or steering to miss a stopped or slow moving vehicle, car, elk, buffalo, or person. You are left with 275 feet to stop your car which is physically impossible (remember natural laws, kinetic energy). People still drive too fast for the illumination their headlights provide.



Slide 13 – Can you stop in time?

Have the students do the math to compute if they have the ability to stop in time if they see something in their headlights traveling at the speeds indicated.

- How far ahead do low beam headlights illuminate? (182 ft.)
- How far ahead do high beam headlights illuminate? (350 ft.)
- How much stopping distance do you need when traveling at 40 mph? (125 ft.)
- If your low beam headlights illuminated a pedestrian ahead would you be able to stop in time to avoid a collision? (Yes - 57 feet of separation space)
- Could you avoid the same collision if you were traveling at 70 mph? (No - 385 ft. stopping distance)
- If your high beam headlights illuminated a pedestrian while you were traveling at 70 mph, could you stop without hitting the pedestrian? (No - stopping distance needed for that speed would take you 35 feet beyond the pedestrian.)



Vehicle speed	Travel ft./sec	Following intervals			1/2 sec steering response	3/4 sec braking response	Total stopping distance
		2 sec.	3 sec.	4 sec.			
30 mph	44 f/s	88 ft.	132 ft.	176 ft.	22 ft.	33 ft.	80 ft.
40 mph	58 f/s	116 ft.	174 ft.	232 ft.	29 ft.	44 ft.	125 ft.
50 mph	74 f/s	148 ft.	222 ft.	296 ft.	37 ft.	56 ft.	190 ft.
60 mph	88 f/s	176 ft.	264 ft.	352 ft.	44 ft.	66 ft.	275 ft.
70 mph	104 f/s	208 ft.	312 ft.	416 ft.	52 ft.	78 ft.	385 ft.

Now direct learners to the chart and ask them to determine how many seconds of illuminated roadway a driver is able to see at various speeds with low and high beam headlights.

Explain that to calculate, they simply divide the number of feet traveled per second into the headlight illumination number. Examples: $182/68 \text{ ft. second} = 2.6 \text{ seconds}$ of illuminated roadway; $350/68 \text{ ft. second} = 5.14 \text{ seconds}$ of illuminated roadway.

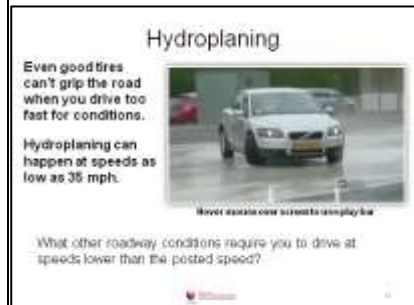
- 30 mph (44 Ft./Sec.) driver sees 4.1 seconds ahead with low beams & 7.9 seconds ahead with high beams
- 45 mph driver can see 2.6 seconds ahead with low beams & 5.14 seconds ahead with high beams
- 50 mph driver can see 2.4 seconds ahead with low beams & 4.7 seconds ahead with high beams
- 55 mph driver can see 2.6 seconds ahead with low beams & 4.2 seconds ahead with high beams
- 60 mph driver can see 2.1 seconds ahead with low beams & 3.9 seconds ahead with high beams
- 70 mph (102 Ft./Sec.) driver sees 1.7 seconds ahead with low beams & 3.9 seconds ahead with high beams

Driving faster than you are capable of seeing is called overdriving your headlights. You cannot gather critical information in time to stop or avoid a collision.

Slides 14-15 – Adverse Conditions: Roadway Surface - Video

Questions you may want to ask after watching video:

1. What causes hydroplaning?
2. What are some factors that will reduce hydroplaning?
3. What should you do if you start to hydroplane?



Slide 16 – Roadway Conditions

There are 6 pictures on this slide. Each shows various roadway conditions from bare wet pavement to packed snow. Each has different traction considerations and involve different strategies for the type of wet and snow the driver encounters.

1. Describe the roadway conditions.
2. Describe the visibility issues and how to solve them.
3. Explain how you would drive in these conditions.
4. Describe how to manage a skid if one were to occur when you were driving.



5. In the fifth picture to appear you will notice that some of the roadway is in the shade and some in the sun—a very common problem in Montana. What does the driver need to be aware of to manage this situation? What should they expect and how should they drive on approach and through this curve?

Slide 17 – Winter driving - Video

How does freezing fog impact traction?
 Do all the cars here have adequate following distance?
 What would happen if one of the cars ahead spun out of control?
 What would you do to avoid the collision?
 What can you do to minimize your risk in this situation?



Slide 18 – Skid Recovery video

Skidding in Montana is unavoidable. You will encounter a skid sometime during the winter or rainy day and you need to know what to do about it. Remember that early detection and correction will help minimize the problems with a skid.

The steps for correcting a skid are:

- Look – Where you want to go
- Steer – Where you want to go
- Off pedals – Release the brake or accelerator to maintain rolling traction.
- Never give up - Maintain constant attention to steering until the vehicle is back under control.
- Use trail braking if needed.



Slide 19 – Hot Weather

There are three considerations during hot weather.

- What is going on outside the vehicle?
 Temperature, HTS users, and roadway conditions such as pavement temperature.
- What is happening inside the vehicle? Passenger comfort, hydration, making sure the car is empty of passengers and pets when you exit the vehicle.
- And what is going on with the workings of the car?
 Is it running at the correct temperature, is it overheating, are the brakes working, and are the accessories overstressing the cooling system?

The next set of slides provides some information to the driver about how to manage these three things. Help the



students work through them and identify what they need to do to minimize hot-weather risks.

Slides 20- Hot Weather: Outside the Vehicle

As summer time approaches, the nation's roads and highways become more crowded and potentially dangerous.

According to the National Highway Traffic Safety Administration (NHTSA), more Americans are killed in traffic crashes during the months of June, July and, August.

Be aware too, that temperatures on the pavement of parking lots and roadways become heated to extremes and can burn your feet and alter your traction on the road. In extreme situations the oils in the road can rise to the surface and can become sticky with tar changing the way the car responds to steering inputs.



Slides 21-22 - Hot Weather: Inside the Vehicle

Review the items listed on the slides.

In addition, the metal parts of car seat buckles can get hot enough to burn. Before leaving the car, cover the car seat to keep it out of the direct sun.

Use a windshield sun shade to cool the inside of the vehicle. This also keeps the steering wheel from getting too hot to touch.



Slide 23 – Hot Weather: Vehicle Operation

If the car overheats, first wait for the engine to cool.

Do not attempt to remove the radiator cap because the pressurized coolant is extremely hot and will spray out with great force.

Do not pour water over the radiator or engine, since a dramatic change in temperature could cause damage.



After the engine cools a bit, add a 50-50 mix of coolant and water to the reservoir to bring it up to its proper level.

An engine may take many hours to cool, especially on a hot day.

If the coolant level is low, the engine should be completely cooled before adding water, or the engine could easily crack.

Slide 24 - How to prepare for adverse conditions

Student activity. Students have been riding with their parents for years and they know a lot about how to get ready for driving in adverse conditions. This is an opportunity for them to share their knowledge with each other about how they would prepare for adverse conditions. Give them three minutes to come up with a list and then share it with the class. The next slide has a partial list and a hyperlink to the MDT Winter Survival Guide so they can download it for themselves.

Working together make a list of what you need to do to prepare for driving in cold weather and hot weather.

WHAT SHOULD YOU DO TO PREPARE?

Slide 25 - Preparing for Adverse Conditions

This slide is a list of things a prepared driver would have in their car in the event of adverse conditions.

- Food and water in the event you have to spend a night or two in your car.
- Warm clothing including a warm jacket, hat, and gloves or mittens, and blanket to protect against cold if you get stuck in a snow or ice storm.
- Reflective clothing or vest so you are visible if you have to put chains on or dig out of a snow bank or muddy road.
- Cell phone is a good idea to call for help but remember there are some places in Montana where your cell phone won't work or has poor reception.
- Good vehicle maintenance will keep your car running and on the road.
- Replace wipers often to have maximum visibility.
- Washer fluid with antifreeze to keep your windshield clean.
- Tires make sure you have traction for action and keep you on the roadway.

Preparing for Adverse Conditions

- | | |
|---|--------------------------------|
| • Food | • Tires with good tread |
| • Water | • Studded snow tires |
| • Warm Clothing | • Chains |
| • Blanket | • Flares or reflective markers |
| • Reflective or high visibility apparel | • GPS <u>and</u> map |
| • Cell Phone | • Small shovel |
| • First Aid kit | • Sand or kitty litter |
| • Full tank of gas | |

[MDT Winter Survival Guide](#)



- **Studded tires and chains increase your traction on slippery roads and should be used when encountering traction loss.**
- **Flares are good to have so you can signal your breakdown or while you are chaining up in the dark.**
- **Map AND GPS in combination. There is a risk of just trusting a GPS because people have been led astray and died when trusting their GPS alone. Knowing your way and having a backup map will reduce that risk.**
- **Always let someone know where you are going and when you are scheduled to arrive. If you don't make it, they will alert someone to help find you.**

For more information, click on the MDT Winter Survival Guide link to open the pdf file.

Slide 26 – Before you go ...

Louis Pasteur said that “fortune favors the prepared mind.” This is the time to demonstrate your maturity and ability to handle the responsibility of driving. Use the MDT road conditions hotline 511 to get complete road conditions or download the MDT Travel app for smart phones that is linked on the slide.

1. Check the weather and road conditions before you leave and plan accordingly if you see a forecast for approaching storm.
2. Set up your smart phone for weather and roadway alerts.
3. This is not about your parents trying to control you, it is about your survival. If you get lost, have a breakdown, a flat tire, or go off the road into a ditch your parents or rescuers will have a very difficult time locating you. At 30 degrees below zero you can get into trouble pretty fast if you haven't planned ahead.
4. Taking the scenic route may be fun, but if you choose a different route than the one you told your parents or friend about you risk being lost and stuck with no hope for help for some time.

Before you go ...

- Check the weather forecast.
- [MDT Travel App](#)
- Plan your route and tell your parents, family member or friend.
- Stick to your route.
- Update parents or friends when route changes.

Slide 27 – Adverse Conditions Summary

Remember, IF YOU DON'T HAVE TO DRIVE, DON'T!!! The more this is reinforced the more the students will get the message that most times students don't have to drive in adverse conditions and they have the option to wait.

Adverse Conditions Summary

Know:

- The dangers of driving in adverse conditions.
- What you are capable of.
- What your car is capable of.
- Your limitations—it's ok to say you shouldn't drive.

If driving conditions are unfavorable, you don't have to drive - stay home and stay safe!

Slides 28-29 – Standards and Benchmarks

Standards and Benchmarks 1-8: This is for your reference and not to be read to the class verbatim. Please review prior to the lesson so you are aware of what the student will be required to know at the end of the module.

Montana Driver Education and Training Standards and Benchmarks

1. **Know and Understand, Define**
 - 1.1. Know the rules related to the Montana Driver's License
 - 1.2. Understand the laws related to the Montana Driver's License test
 - 1.3. Understand, demonstrate knowledge and understanding of appropriate behavior in highway, transportation system, traffic laws and related issues
2. **Recognize**
 - 2.1. Recognize the importance of making safe and responsible choices when driving and operating a motor vehicle
 - 2.2. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 2.3. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 2.4. Understand the rules, laws, regulations, policies, and procedures related to driving
3. **Apply Skills**
 - 3.1. Apply skills related to driving a motor vehicle
 - 3.2. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 3.3. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 3.4. Understand the rules, laws, regulations, policies, and procedures related to driving
4. **Recognize**
 - 4.1. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 4.2. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 4.3. Understand the rules, laws, regulations, policies, and procedures related to driving
 - 4.4. Understand the rules, laws, regulations, policies, and procedures related to driving

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